

Empirical and Molecular Formulas

Empirical Formulas – the simplest whole number ratio of atoms in a compound

A) Determining empirical formula from mass:

- 1) find the number of moles of each element
- 2) obtain the simplest ratio of each element by dividing the number of moles of each by the smallest number
- 3) round off the ratios to the nearest whole number

Note: if you have .50, then multiply all elements by 2

Problem: Calculate the empirical formula of a compound if it contains 6.60 g of Calcium and 3.40 g of Phosphorus.

B) Determining empirical formula from percent:

1) Assume 100.0 g of a compound so % = mass and solve just like the above problem.

Problem: Calculate the empirical formula of a compound that is 18.8% Nickel and 81.2% Iodine.

Molecular Formulas – the actual number of atoms in a molecule

Note: the empirical and molecular formula may be the same (example: water)

***If we know the empirical formula and the molecular mass we can calculate the molecular formula.

Method:

- 1) Divide the empirical formula mass into the molecular mass
- 2) Multiply the empirical formula by the answer from step 1

Problem: What is the molecular formula of a compound that has an empirical formula of CH_2O and a molecular mass of 90.0 g/mol